THE SIGHT-SAVING REVIEW

Summer, 1949

"Let There Be Sight"

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Congenital and Hereditary Eye Diseases*

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ALTHOUGH much remains to be learned, there is already a body of information about congenital and hereditary eye abnormalities which can be applied to prevent needless blindness from these causes.

NEARLY 60 per cent of blindness in children is caused by congenital and hereditary eye diseases which could be materially reduced through intelligent medical and lay cooperation. To combat blindness from these causes it is necessary to urge the public as a whole and the medical profession as a group to give serious thought to prevention of hereditary blindness and, further, to educate those so afflicted with the facts of the hereditary nature of their specific eye disease. Afflicted individuals should be thoroughly informed on the hereditary potentialities of their specific eye diseases. Knowing the facts, they must weigh the chances of transmitting such handicaps to their offspring, and unselfishly make their decisions.

Nonhereditary Congenital Eye Diseases

Congenital eye defects (those present at birth) need not be hereditary. Abnormal prenatal conditions may create eye abnormalities which often resemble known hereditary congenital conditions. Consequently, the cause of a given occasional eye malformation cannot be determined without an exhaustive investigation of the family history, and careful inquiry concerning the mother's health and course of her pregnancy. The first three

* Part of the studies on which this paper is based were supported by the Heredity Clinic, Laboratory of Vertebrate Biology, and by Research grants from the Horace H. Rackham School of Graduate Studies, University of Michigan.

months of pregnancy are the most important so far as the health of the expected baby is concerned. Harmful influences and disorders at this period may produce serious malformations of the eyes, ears, brain, heart and liver.

Ophthalmological literature during the past five years has been replete with articles stressing the dire effects of German measles, prematurity, and toxoplasmosis in the production of congenital ocular malformations. Toxoplasmosis is defined as a disease produced by a certain one-celled parasite which causes convulsive death in infants.

German Measles.—Early in the 1940's, in Australia an unusual number of congenital cataracts was observed.[7] Careful questioning of the mothers of those afflicted children brought out the fact that all had had an unusually severe attack of German measles during the first three months of pregnancy. Subsequent investigation has verified the very high incidence of cataracts observed in infants born under similar circumstances; and other eye conditions such as hydrophthalmos, pigmentation of the retina, corneal opacification, and microphthalmus have also been reported. Rather widespread general associations have been observed which support the idea that a harmful agent acting during the first trimester of pregnancy will seriously impair the development of various organs. Defects of hearing, abnormalities of the heart, mental deficiency, microcephaly (abnormal smallness of the head), and errors of metabolism (liver defect) have frequently been associated in these children.

There is some evidence that during the first three months of pregnancy other virus diseases, specifically mumps, chickenpox, and ordinary measles, may also affect the fetus.

Toxoplasmosis.—Infection with the minute, one-celled form of life known as toxoplasma may produce an inflammation of the brain in humans, especially in utero. Rats, other rodents, and birds frequently carry the one-celled parasite causing this disease, and they may transmit it to humans. In infants and children a history of convulsions, hydrocephalus, mental retardation, speech difficulties, intracerebral calcification, and defective vision should suggest the possibility of toxoplasmosis.[6] The parasite is evidently capable of passing through the placental barrier and thus infects

the fetus. It seems especially to affect the nervous system in the fetus. Extensive, sharply punched out chorioretinal lesions in and about the macula are the characteristic eye manifestations of the disease. Inflammation of the optic nerve is a most frequent association, but abnormality of the front part of the eye has also been observed. Medical literature suggests that this disease is rather common and widespread, and our experience supports this observation.

Retrolental Fibroplasia.—Modern advances in the management and care of the premature infant has resulted in keeping alive many infants that heretofore have perished. Terry[1] and his associates have reported that over 10 per cent of the infants weighing less than three pounds at birth have subsequently developed retrolental fibroplasia. This is a condition which seems to proliferate after birth, invades the vitreous and occasionally the crystalline lens. Partial blindness, cataract, retinal folds, retinal detachment, glaucoma, and atrophy of the eye may result from this abnormality of growth.

Owens[3] and his co-workers followed the development of the numerous variations of this disease process in premature infants whose eyes were normal at birth. Statistical evidence has been presented revealing that water soluble vitamin A administration to these infants may in some way have contributed to the development of the pathology. Other authorities maintain that the disease is present at birth and that prematurity is not a specific requisite.[2] The frequent association of mental deficiency and retardation in Krause's[4] cases has prompted him to call the disease congenital encephalodysplasia.

Our personal investigation has not disclosed a hereditary etiology. Serological incompatibility likewise does not seem to be a contributory factor. In our experience prematurity itself may be an attempt on the part of the maternal organism to get rid of abnormal protoplasm. Surely our elaborate attempts to save and rear such extreme prematures may thus be questioned.

Nutritional Deficiencies.—Maternal nutritional deficiencies have been reported responsible for the production of abnormalities of the eye in experimental animals. Ocular defects were induced in animals by withholding certain essentials such as vitamins D and

A from the diet.[5] Little is known about the influence of maternal subnutrition on the developing fetus in humans. It should be emphasized, however, that subnutrition may permit the action of certain genes which would not have functioned in a more favorable environment.

Heredity

The field of ophthalmology has long been impressed with the tremendous rôle played by heredity in the production of ocular abnormalities. In fact the cause of a large proportion of the known eye diseases and defects must be attributed to heredity. Rapid progress is being made in this field at present and will be even more rapid in the near future. It will be to the advantage of social workers, nurses, teachers of the blind, and the medical profession to become familiar with the present knowledge of human heredity in order to evaluate the statements and articles that are and will be appearing in print. A knowledge of heredity may be utilized as an aid both in diagnosis and in prognosis.

The laws of heredity are fundamentally simple and concise, yet their understanding requires diligent study and application. No advice on genetic problems should be given by any individual unless: (1) he is thoroughly familiar with the laws of hereditary behavior; (2) he is competent to diagnose and interpret all variations of the disease being considered; and (3) he has performed a careful investigation and analysis of the family in which the disease is present. The last factor should be further elaborated to include a careful examination of all the available normal relatives as well as the reported afflicted individuals. Even when these requisites for giving genetic advice are met it must be realized that the adviser can merely suggest and aid. It is for the prospective parents to make the decisions. The family doctor, by kindly and intelligently guiding these individuals, can aid them in making wise decisions. Through the prevention of transmission of hereditary eye abnormalities the physician can influence, in a small measure, the genetic constitution of the nation as a whole.

Heredity and environment combine to produce any finished characteristic. In certain circumstances one or the other influence may appear negligible but the combined effect can always be

demonstrated. In the majority of cases, eye diseases or defects are the combined product of hereditary and environmental influences.

Gene Theory.—Modern principles of heredity are based on the gene theory. Contained within the nucleus of the germ and somatic cells (body cells) is a variety of protoplasm called chromatin. Chromatin, consisting largely of protein compounds, exists in the form of a number of lumps or rods known as chromosomes. Every species has a characteristic number of chromosomes, the human race possessing 48—23 pairs are similar as to size and shape, and 1 pair is unlike in the male sex. The latter chromosomes (called X and Y) are responsible for the determination of sex. These chromosomes are but the vehicles of minute structural units, the hereditary factors, or *genes*. Each chromosome consists of hundreds of separable genes each having a fixed place in the single file order, and each probably possesses a specific highly distinctive internal composition. In this latter respect each gene differs quite radically from its immediate neighbor. Each gene has a very specialized rôle (or rôles) to play in governing the production of the final product—the individual. Although most traits are the product of the interaction of many genes and modifiers, it is most convenient for purposes of discussion to associate one gene with one characteristic or trait—hence the conception of units or characters.

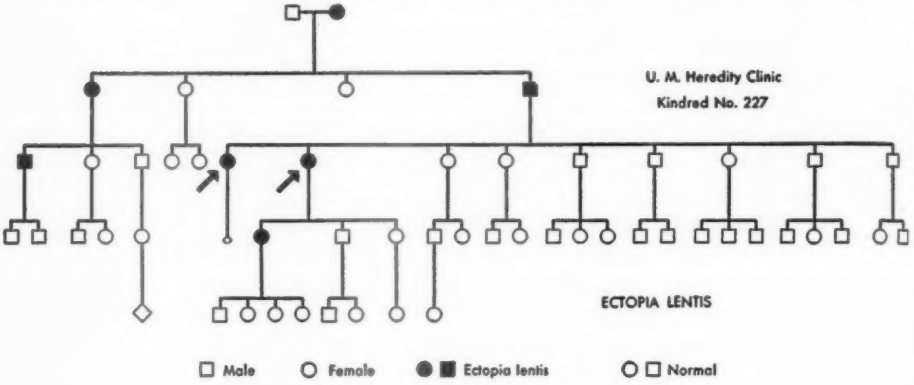
While there are many types of hereditary transmission patterns known, the major kinds of genetic eye behavior are the *dominant*, *recessive* and *sex-linked*.

Dominant Inheritance.—This pattern of hereditary transmission is the most dramatic and gets attention because of its obviousness. The mode of inheritance is evident, for whenever the abnormal gene is present its effect is produced.

In dominant inheritance, the following conditions are always manifest:

1. Each affected person has an affected parent.
2. An affected person may be expected to transmit the trait to about 50 per cent of his or her offspring.
3. The trait is manifested successively generation after generation.
4. Normal offspring of an affected individual cannot transmit the abnormal gene since they do not possess it.

FIG. 1.—PEDIGREE OF ECTOPIA LENTIS DISPLAYING TYPICAL DOMINANT INHERITANCE PATTERN



Recessive Inheritance.—The important factor in recessive inheritance is that the affected individual must have received the gene for the trait from both parents, and thus both members of the chromosome pair must carry the abnormal gene at the same location. Since the single gene state does not manifest the disease the recessive gene may be transmitted undetected for many generations. The carrier parents are thus unaffected and the abnormality presents itself as a "familial trait"; i.e., more than one child in a large family may be affected. Cousins will have a greater probability of carrying rare abnormal recessive genes than will mates who are not kin; hence children showing rare recessive defects will very commonly be found to be the issue of cousin marriages.

In recessive inheritance, the following conditions are manifest:

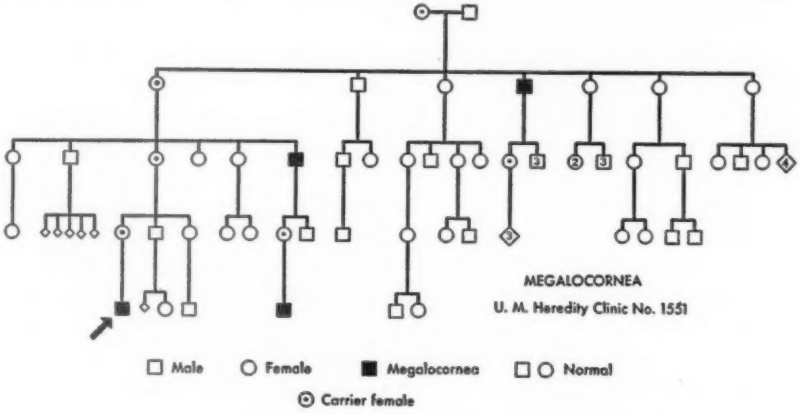
1. Neither parent shows the trait but both are carriers of the abnormal gene.
2. The rarer the trait the higher the proportion of blood kinship among the parents over that found in the general population.
3. When, as may rarely happen, two affected individuals marry, all of their children will exhibit the trait.
4. Approximately 25 per cent of the brothers and sisters may exhibit the trait.

It is possible for a recessive eye defect to appear suddenly in a family apparently previously free of it, and then disappear in the

next generation. Obviously, recessive traits are most difficult to recognize as hereditary.

Sex-linked Recessive Inheritance.—In this pattern of inheritance, the abnormal gene is recessive and is borne on the X-chromosome. The carrier female—possessing one X-chromosome with the abnormal gene and another X-chromosome with the normal gene—does not manifest the disease, but can pass it on to the next generation. The male possessing the X-chromosome bearing the abnormal gene is affected because his Y-chromosome does not prevent the expression of the factor. A pedigree of sex-linked

FIG. 2.—PEDIGREE ILLUSTRATING SEX-LINKED RECESSIVE INHERITANCE OF MEGALOCORNEA



inheritance is highly characteristic and nearly as dramatic as a pedigree of dominant inheritance.

The following conditions prevail in cases of sex-linked inheritance (recessive):

1. Affected individuals have a normal parent for the trait in question.
2. The females who are carriers have affected and normal sons in approximately equal proportions.
3. Carrier females have carrier and normal daughters in approximately equal proportions.

4. The affected male cannot transmit the abnormal gene to his sons because he can only give them the uninvolved Y-chromosome.

5. All daughters of an affected male will be carriers for the abnormal gene.

6. The gene is transmitted through carrier females and is expressed in males.

7. Unaffected males cannot transmit the trait.

8. Women rarely display the trait, since it is necessary to have received the gene from a carrier mother and an affected father.

Dominant forms of sex-linked inheritance are known as well as dominant and recessive incomplete sex-linked patterns.

Hereditary Eye Diseases

Inherited eye diseases present a most imposing list, but only a minute proportion can be covered in a paper of this scope. Most of the eye diseases usually interfere so seriously with the physiology of the eye as to have a damaging effect on the visual acuity.

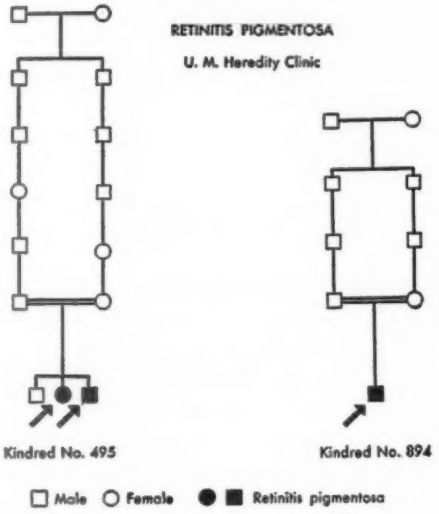
Cataract.—Cataract (opacity of the crystalline lens) may be congenital, juvenile, or adult in time of appearance. Dominant, recessive, and sex-linked recessive patterns of inheritance have been reported in several specific varieties of congenital cataract. I personally have seen clinically identical zonular cataract inherited in all three patterns in different families. Presenile and senile cataract is often familial. Senile or wedgeshaped cataract may be observed in identical form in several members of a family.

Glaucoma.—Pedigrees of hydrophthalmos (a globular protrusion of the cornea), juvenile, adult and senile primary glaucoma have been reported with increasing frequency. The hope for retaining visual acuity within guarded limits is poorest the earlier in life the glaucoma manifests itself. Hydrophthalmos and juvenile glaucoma are notoriously difficult to manage. In our experience hydrophthalmos occurs most frequently in sex-linked recessive and simple recessive patterns. Juvenile and adult primary glaucoma has usually manifested dominant transmission. The interested and alert physician will stress the hereditary potentialities of this disease to his patients and their relatives. Early treatment is vital to preservation of vision. The families of afflicted individuals should

furnish a fertile field for the social worker, glaucoma clinics and glaucoma detection units, in discovering early glaucoma.

Strabismus (Cross-eyes).—Strabismus, paralysis, and other abnormalities of the external eye muscles may and do exhibit hereditary transmission. Instigation of early occlusion and orthoptic therapy is necessary to prevent the development of amblyopia. Careful investigation of the affected individuals, their antecedents, and their brothers and sisters, will provide information and data important and pertinent to the diagnosis, prognosis, and treatment of strabismus.

FIG. 3.—ILLUSTRATES RECESSIVE INHERITANCE OF RETINITIS PIGMENTOSA. THE DOUBLE MARRIAGE LINE INDICATES A CONSANGUINOUS UNION



Abiotrophies (Heredo-degenerative).—Recent interest has evolved in eye degeneration as a result of the modern tendency to establish the causes of many diverse pathological phenomena previously classified as disease. An abiotrophic disease is usually hereditary in character, develops in fully mature and normal tissue, and appears in different families at different periods of life. Varia-

tions in form may be evidenced within a family, but there is always a strong resemblance as to onset and course. Constitutional abiotrophies, which affect most of the eye tissues are now recognized. Retinitis pigmentosa is one of the abiotrophic diseases and has been found to be recessive in some families, dominant in others, and sex-linked in others. Recent evidence suggests that the disease is more severe earliest in onset and effects blindness at an earlier age when it is inherited in the order of simple recessive, sex-linked recessive, and dominant patterns. There are many exceptions. Deafness is a frequent accompaniment of the usually severe recessive form of the disease.

Many varieties of macular degeneration are known and recognized as heredo-degenerative. Similar abiotrophy occurs in the choroid, with an associated secondary retinal atrophy. These latter retinal changes account for a considerable proportion of visual loss in the aged.

The rôle played by heredity in ocular degenerations will command the interest and study of workers in the new field of ocular geriatrics. What is physiological and what is pathological in the senile changes of the eye tax the most acute diagnostician. The field of ocular geriatrics is wide open for the combined research efforts of the geneticist, the clinician, the biochemist, and the physiologist.

Birthmarks and Hereditary Eye Diseases.—Bourneville's, von Recklinghausen's, von Hippel-Lindau's, and Sturge-Weber's diseases are hereditary and congenital, each having a special clinical entity. All of these diseases exhibit wide constitutional and ocular pathological features, and are associated with the presence of coffee colored moles on the skin or mucous membrane, and blood tumors, frequently present at birth.

Myopia.—Progressive or malignant myopia which is accompanied by serious degenerative changes in the retina may result in blindness. Many pedigrees display a dominant pattern of inheritance, yet in other families a recessive mode of inheritance is known.

Errors of Fat Metabolism.—Amaurotic idiocy may assume many forms which are believed to be clinical entities, yet many similarities point to a common basic underlying factor. Tay-Sachs disease, juvenile amaurotic idiocy, Batten-Mayou disease, Niemann-Pick

disease—all have much in common in that they present a somewhat similar abnormality of fat metabolism.

Summary

1. Education of the general public and the medical profession in the principles of human heredity is an outstanding need of our time.

2. Hereditary ocular abnormalities may be eliminated in certain families by intelligent cooperation between family and physician.

3. Genetic advice should not be given without sufficient, careful and meticulous study of the *specific* family concerned.

4. Sex-linked, recessive and dominant patterns of inheritance of the identical clinical disease are known. Retinitis pigmentosa, cataract, glaucoma, corneal degeneration and macular degenerations are but a few eye diseases demonstrating this phenomenon.

5. Isolated or sporadic cases of gene-produced or harmful-agent-effected abnormalities of the eye may appear without the physician's being able to distinguish clinically any diagnostic differences.

6. The presence of a congenital ocular abnormality in a baby should be the indication for a careful ophthalmologic and genealogic study of the entire family.

7. Serious congenital ocular disease may be effected by German measles and like virus diseases, toxoplasmosis and prematurity.

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Promoting Eye Safety*

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DESCRIBES how an industrial plant can install an eye safety program and thereby increase its efficiency and decrease its accident rate—saving sight as well as money.

WHEN it comes to industrial injuries, none are more dreaded than those affecting the eye. The devastating effect on the life of an individual who loses his sight can be readily understood when we realize that approximately 85 per cent of all of the stimuli we receive come to us through the medium of only *one* of the five senses—the eye.

There comes a time in every safety engineer's life when he decides he is going to do something about the eye protection program in his plant. This determination is usually brought about by an analysis of all of the disabling eye injuries that have occurred to people in his plant. A recent survey covering 22 years' experience in one of our plants revealed that during this time, eye injuries occurred to employees on 96 different occupations, ranging from bench hands who suffered the greatest number of eye injuries through screw machine operators, platers and dippers, welders, wiremen, and even some clerical workers. It is apparent that eye injuries spare nobody. Four per cent of the injuries during this same period occurred to supervisors themselves. The outstanding single cause of eye injuries was failure to wear safety glasses though they were provided. If you have lost even one eye in your plant, that is enough indication for you to decide that an adequate eye protection program must be installed.

* Presented at the 40th Anniversary Conference of the National Society for the Prevention of Blindness, New York, March 16 to 18, 1949.

Analysis of Hazards

It is wise to decide right at the start to do the safety job right. It should begin by surveying every operation in the plant. The safety engineer should look at the possibilities on each job of having a worker's eyes hurt, and then determine from those possibilities the types of protection that must be given. Then he should chart that protection in very definite form. Some of the workers are going to need just the spectacle type of glasses. Incidentally, I like the term "safety glasses" better than "goggles." It is an added plug for safety. Other employees are going to need side screen safety glasses. Of course, those working with acids are going to need acid safety glasses. Others will need the cup-type on their jobs. Every job should be charted, and beside each job should be indicated the eye protection that is recommended.

Selling Management

Now you have the job of selling management on the value of such a program. This should not be too difficult because you are able to present facts and figures to show what the cost has been in the past through medical expense and compensation payments and time lost and all of the other cost factors that are involved in eye injuries. Then estimate the cost of your prevention program, and I don't think you will have much trouble convincing management that it is smart to spend money to save money as well as eyes.

Oculist and Optician

After obtaining management's approval, then an oculist and an optician should work with the safety engineer. They should be brought into the plant, if possible, on a part-time if not on a full-time basis. There are very definite reasons for this. A certain percentage of prescription safety glasses will be required if the job is to be done right, and for that an oculist is needed. If he can do the eye examinations in the plant itself, a lot of time and money can be saved. The plant oculist performs a very valuable service. In addition to doing the refracting, he can do a continuous selling job on the value of adequate eye protection. Then, too, he is available for consultation as to the types of correction necessary due to the

varied working distances existing on certain jobs. By going into the plant and looking at these jobs and measuring these distances, he can be sure that the individual is getting the exact type of correction that is going to enable him to do the job most efficiently. It stands to reason that work efficiency is increased when effort is made to improve the eyesight and safety of employees through provision of prescription safety glasses.

After both the prescription and plano glasses (safety glasses with no correction) have been obtained, an optician is needed to fit them. With all due respect to the storekeepers and tool crib attendants who hand out these glasses in most plants, they are not trained to do a good job of fitting. If safety glasses are comfortable, half the battle in getting people to wear them is won. Every time the optician fits a pair of safety glasses, he can do a selling job for safety. He can tell the employees what the plant is doing to conserve his eyesight, and convince him that he should come back any time that his safety glasses need adjustment.

It is also necessary to plan for an adequate examination room, a fitting room and a storeroom for spare parts and supplies.

Care of Safety Glasses

Employees must be taught to take care of their safety glasses. So many of them lay a pair of glasses down so that the lenses become scratched. After a few scratches appear, visibility is cut down to the extent of distracting the individual who wears them. The employee must learn to use his glasses correctly and not to abuse them. He must learn to keep them clean.

Supervisory Group

The first step in setting up a program is to present in writing the charted safety needs of every job to every supervisor in the plant. If he gets the facts in writing, he cannot dodge the responsibility of seeing that the correct safety glasses are worn on each job, as indicated on the chart. Then rules should be set up for him. He should be responsible for:

1. Equipping the employees with the necessary authorized personal protective items.

2. Instructing them in the proper use of such equipment.
3. Requiring the wearing and use of such protective equipment.
4. Requiring that protective equipment be properly maintained, adjusted and promptly replaced when necessary.

Many people complain, "Well, I can't get the man to wear safety glasses." But is that not just anticipating trouble? When there is a new job to be done in a plant, the engineers make a layout of the machines, the materials, and the processes that will be necessary for that particular job. The workers don't come in saying, "I don't think this job should be done this way. I don't think we should use this type of material." They accept the specifications drawn up by experts. Why cannot it be written into the specifications—along with the type of material and the process of work—that for this particular job a certain type of eye protection is mandatory? Let it be assumed that the eye protection is part of the job layout. We are always talking about making safety an integral part of every job. Let's practice it and see if it really works. If it were approached from this angle, there should not be too much trouble.

The safety engineer has to do a selling job. After he gives the supervisor the chart and tells him what is required on the job, he has to sell him on the idea. He cannot just hand over the chart and say, "Here it is, Brother. They are going to wear them." He must tell the supervisor why he and his people should be interested in the eye protection program. And once the supervisor is won over, 90 per cent of the problem is solved because the supervisor can make or break the program. It will pay to sell the first-line supervisor.

Savings

"All this is costly and the cost might be prohibitive," is the fear expressed by management at times. Let me give you a few figures for a two-year period for the Western Electric Company. In that time we issued about 3,700 pairs of prescription glasses and about 18,000 pairs of planos.

In all, it adds up to almost 22,000 pairs of safety glasses, which, with the cost of the oculist and optician and a few minor expenses, have cost about $58,000. But for that same period of time, I have in my desk 24 pairs of safety glasses in which the lenses are shattered. Every one of them undoubtedly saved an eye. As a matter

of fact, there must have been many more cases in which the impact of the flying body might have been enough to blind an unprotected eye but was not enough to crack the safety lens, and these would not be brought to me. At least 24 eyes were saved in two years. The normal compensation rate and all the attendant expense for the loss of an eye runs to about $3,000. At that rate, 24 eyes would have cost us $72,000. We spent $58,000. Purely from a profit-and-loss standpoint, we saved $14,000. But a more important consideration is that these 24 employees still have unimpaired vision. Their earning power has been preserved for the rest of their lives; they have been saved the intense mental and physical suffering attendant on the loss of an eye. It is no exaggeration to say that a good eye protection program will pay dividends beyond measure.

The Treatment of Crossed Eyes*

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EMPHASIZES the need for early treatment not only of vision but of the crossed eye, and describes the rôle of orthoptics.

MOST of us will agree that the three things to be accomplished in the treatment of crossed eyes are: (1) the gaining and maintaining of good vision in each eye; (2) regaining and maintaining alignment of these eyes; and (3) teaching these eyes to see together again, or at least encouraging them in that ability.

It is well recognized that there are various types of crossed eyes, and each type may require a different form of treatment. Some types respond well to glasses, others to exercises; some require surgery, while still others may need all of these forms of medical attention. Neither the patient (or parents) nor the oculist may choose the form of treatment. The type of crossed eyes in large part makes the decision for them.

While these facts may be well understood, there are several things which seem less clear and may need further emphasis. Two of these shall be the subject of this discussion: (1) the necessity for early treatment and (2) the rôle of orthoptics. This latter topic is quite controversial, and admittedly the final word is yet to be said.

"Two-Eyed Vision"

In order to understand either of these two points, a fair conception of how "two-eyed" vision develops, and what happens when "two-eyed" vision is interrupted, must be considered. When first born, the infant's macula (e.g., the retinal center for detailed

* Presented at the 40th Anniversary Conference of the National Society for the Prevention of Blindness, New York, March 16 to 18, 1949. Published simultaneously in *Public Health Nursing*, June, 1949.

vision) is poorly formed and differentiated. The eye, in consequence, has not the ability to look steadily at a given object, but roves around. In addition, the mechanism for the "seeing together" of the two eyes has not developed, so the eyes frequently are out of line. This is normal until the age of 2 to 6 months—some infants maturing more rapidly than others.

If, because of disease of the macula or interference with light rays before they get to the macula (as in congenital cataracts, corneal opacities, retrolental fibroplasia, etc.), the macular vision cannot develop, the eye continues to rove about, and good central vision never develops.

On the other hand, if the visual machinery develops well, but the eyes are out of line from birth or soon thereafter, the habit of "seeing together" (fusion) cannot develop, and so the desire to see together with two eyes does not exist. If this condition continues until after the age of 6 or 8 years, the habit of seeing together probably cannot develop, and the ocular alignment is unstable for the rest of life.

If the eyes, however, line up early in life (i.e., at 6 months or younger), the habit of seeing together, just as any other habit, becomes strong from constant or frequent use. Because the habit of seeing together is strong, the eyes will make every effort to stay straight in order to continue seeing together, and thus will be straight and steady the rest of life.

"One-Eyed Vision"

Occasionally, after the habit of seeing together with straight eyes has gone on for two, three or four years, the eyes will cross due to factors beyond the control of the individual. When this first happens, the child will see double for a short while. But nature, realizing what a disturbing thing double vision is, soon allows the child to mentally "turn off" (i.e., suppress) the vision in one eye or the other. When this first occurs, the vision is probably good in each eye, but as time goes on, the vision in the crossing eye actually deteriorates from lack of use (i.e., amblyopia ex anopsia). Should this disuse continue until after the age of 8 years, probably no amount of treatment will restore full vision, and frequently the vision remains quite poor.

In addition to this development of poor vision from disuse in crossing eyes, the act of seeing together is no longer possible because the two eyes are focused in different directions, and on different objects. Thus the habit of seeing together (fusion) begins to deteriorate, and the longer it is left unused, the harder it is to re-establish. However, the longer the child had straight eyes and fusion to begin with, the easier the habit will be to re-establish. Equally true is the fact that the more the eyes are lined up and seeing together during the first 6 to 8 years of life, the stronger fusion is, the harder it is to interrupt, and the easier it is to re-establish.

In addition to the interruption of the seeing-together habit when eyes cross, certain false habits may develop. The macula in the "straight" eye, now lines up with some place off the macula in the crossing eye. These two areas will attempt to see together if the opportunity presents itself long enough. This condition is called abnormal retinal correspondence, and while two eyes can never see together well under these circumstances, the false habit must be broken down in order to re-establish normal retinal correspondence and allow the two maculae to see together again.

Necessity for Early and Continuous Treatment

Increasingly, the medical profession and the public must be made aware of the fact that if vision is not used in an otherwise normal eye during the first 6 to 8 years of life, it will not improve later. Thus the necessity for early treatment is apparent. It is possible to estimate an infant's ability to see by his ability to look steadily and directly at an object of interest. After the age of 3 or 4 years, the vision may be measured by using the Snellen "E" chart. When vision is found poor in a crossing eye, the "good" eye should be patched constantly until the good eye and the poor eye have equal vision. The child's vision in each eye should be estimated frequently (every 1 to 6 weeks, depending on the age of the patient), and patching continued as long as necessary. Of course, the patching does not cure the crossing of the eye. It merely improves the unused vision.

In addition to treating the vision early, treating the crossed eye early is equally important. If the habit of seeing together fails to

develop or is interrupted early in life, the fusion sense suffers. The earlier the eyes can be lined up again, the sooner the habit may be restored and the stronger it gets. Therefore, if need for glasses is indicated they should be given early—as early as 12 to 18 months in some cases. If surgery is required, it should be done as early as the need is apparent and the findings sufficiently exact. This again may be as early as 18 months. Both glasses and surgery can be used on the 18-month-old child rather easily when indicated.

It should be remembered that just because the vision has been restored or because the eyes have been realigned, they may not remain so. It may be necessary to patch the "good" eye at intervals for months or years. It may also be necessary to supplement surgery with further surgery or with glasses, if these procedures are necessary to gain and maintain straight eyes during the first 6 to 8 years of life. No eyes can learn to see together unless they have the opportunity for it.

Orthoptics

To understand the more controversial rôle of "orthoptics" in the treatment of crossed eyes, an understanding of the previously discussed development of vision and binocular vision is necessary. By orthoptics we mean "graded exercises or maneuvers to attain and improve single binocular vision."

When the eyes begin to cross, they first go out of line, then follow double vision and suppression, and later actual loss of vision in the crossing eye occurs. In treating crossed eyes, the process must be reversed. By patching, the vision is improved. Then the child must be taught to see double again so that he is visually conscious of his crossed eye. Then the eyes must be lined up, so that they may have the opportunity to see together. Teaching a child to see double and how to control this double vision usually requires that the child be at least of school age, so that he can maintain interest and attention long enough (15 to 30 minutes) at any one session, and frequently enough (as often as 2 to 5 times a week) to accomplish the objective desired. Further, this child must have had the opportunity for binocular vision at least a part of his first 6 to 8 years.

I feel that orthoptics alone rarely straightens eyes but rather helps to stabilize eyes in the straight position, if they are capable

of being placed there by conscious effort, glasses, or surgery. Orthoptics is an excellent adjunct to the intelligent treatment of crossed eyes, but does not replace the other known methods of treatment. However, a definitely higher percentage of crossed eyes can be made stable and seeing together when orthoptics is used than when treated by surgery and glasses alone.

Conclusion

In conclusion, it is well to remember that the early treatment of crossed eyes is essential in order to prevent or restore visual loss in the crossing eye, and to allow the greatest possible opportunity for single binocular vision. In an equally conclusive fashion, it is felt that orthoptics is a valuable adjunct to the treatment of crossed eyes at the school age, but is seldom a substitute for any of the other forms of treatment.

The Ophthalmologist's Contribution to Industry*

Ralph S. McLaughlin, M.D., *Ophthalmologist*

Charleston, West Virginia

POINTS out the partnership between industry and medicine which makes for greater safety, better eye care, and increased production.

IN the past decade human requirements have undergone a radical change. We are passing through an era of war and its aftermath which presents a kaleidoscopic picture of rapidly changing conditions. These changes have forced industry to produce new and better products with a speed heretofore undreamed of. To accomplish this end many previously unrelated fields of endeavor have been forced into close cooperation with industry.

The field of ophthalmology is one which has accepted the call of closer cooperation, and while much has been accomplished, there still remains an open field for new contributions in the future. In the past the ophthalmologist has acted more or less as the port of last resort after an eye accident has occurred. The new trend should be as forceful on preventive measures as on curative measures.

The Ophthalmologist Recognizes His Responsibility

Through our study of the eye and repeated contact with employees in industry we can see a definite place for our services in all industry. We have no apologies to offer for being forward in asking that these services be used, for that is covered by our Hippocratic Oath in which we swear that we will do everything in our power

* Presented at the 40th Anniversary Conference of the National Society for the Prevention of Blindness, New York, March 16 to 18, 1949.

to help our fellowmen along the pathway to health and happiness. We only ask that industry utilize these services with the same philanthropic spirit in which they are offered.

We of the medical profession have set up and support what is known as the Joint Committee on Industrial Ophthalmology, a committee sponsored by the American Academy of Ophthalmology and Otolaryngology and the American Medical Association. This committee has as its function the collection and dispersion of all information and research held or discovered by members of either group. In these two associations all doctors are reached, and therefore all new procedures and medications are promptly channeled into this one central clearing house. From this wealthy source, information is then available to one and all by way of our able secretary, Dr. Hedwig Kuhn of Hammond, Indiana. In addition, not waiting for specific requests, work is published as rapidly as possible in current literature, and a section of the *Transactions* of the American Academy of Ophthalmology and Otolaryngology is given over to republication of new discoveries, and a very worthwhile index of references of all material published in any publication, of articles of interest to the industrial field. I am positive that through your own consulting ophthalmologist, or through Dr. Kuhn directly, requests for information will be promptly and graciously answered.

Developing Suitable Safety Glasses

One of the most important of the activities of the ophthalmologist in the past few years has been the development of safety eye wear. Since the beginning of industry, eye injuries have been among the most costly of accidents. In the chemical industry, according to a survey,[1] the cost per employee was $2.00 in 1941. In 1948 the cost was $0.30. Now, how was this change accomplished? This problem was attacked in 1939 from two points. First, we planned a protection program which placed protective eye wear on every employee. This was accomplished by issuing plano glasses for the normal eyes, and corrective glasses for the employees having refractive errors, who normally wore glasses, or who developed the need for correction at a later date. This program required the services of the ophthalmologist and the optician. Considerable

trouble has been encountered in the fitting of safety glasses as, in the case of many industries, such appliances have been looked upon as a commodity that can be purchased at wholesale like a pair of work pants. This is not the case, and complete success of this program cannot be achieved until properly trained men are attached to the plants to measure and adjust for the placing of the ophthalmologist's prescription on the employee's face. The failure to handle these appliances in this manner has been the explanation of failure of the protection program in many plants.

The other point of attack in the chemical industry was the handling of chemical burns of the eyes after such accidents did occur. By good fortune and research a method was developed which has solved this problem. This method was developed in 1939 and eventually reported as an improved technique in 1946.[2] We now are pleased to report a series of over 2500 cases with an over-all loss of vision of less than two per cent. In the last 500 consecutive cases there has been but one lost eye, and that was due to the failure of the employee to seek first aid within the necessary period of time.

Job-Rating According to Visual Acuity

The ophthalmologist has contributed another study which has been of great benefit to both industry and the working man. This is in the field of job-rating as it is based on visual acuity.[3] Here we are advising that each job be rated as to the needed acuity, both far and near vision, which will enable the employee to do satisfactory work safely. Various standards and machines have been developed for visual-rating and these will, in the hands of trained personnel, make possible a rapid and accurate analysis of the vision of an employee. To me it is one of the most forward moves that we have offered in many years. Both doctors and laymen can recall injuries to either eyes or person, which when studied have been so evidently caused, in part or whole, by inferior vision. It is difficult for industry to accept job-rating at once, for so many problems of seniority, old employees, trusted and experienced help, come between them and the full use of such a program. However, it is to be sincerely hoped that this rating will become a deciding factor in the placement of new help and replacement of old. From a strictly economic view-

point much better efficiency can be expected from a program of this caliber.

Along with the job-rating program more and more industries are taking note of lighting conditions. I hardly think we eye men can claim full credit for this step, but certainly we have been enthusiastic boosters for the improvement of this working condition. We naturally would be, for vision is nothing more than properly reflected light rays converted to visual sensation.

Medical Research in Relation to the Eye

The research men of medicine, trying to meet the demand for increased efficiency, have furnished us with a new series of medications which are aiding us greatly in the curative field. These are the antibiotics. You are all familiar with the effect of penicillin on infections. Now they have added aureomycin and bacitracin. In the ophthalmic field these have found their place in the treatment of corneal injuries and infections of the external eye tissues. Many more of these antibiotics are known but are still in the realm of experimental medicine and have not yet been proven. The possibilities in this field are unlimited.

Atomic research has furnished ophthalmology with another product which is now an accepted treatment for the injured cornea which develops new blood vessels where none should exist. That is the beta-ray of radio active material. Many, many eyes are being salvaged now by this treatment which were previously hopelessly blind. We have great hopes that this will make corneal transplantation available to cases which are now impossible due to vascularization.

Surgery

Surgery of the eye is a constantly changing accomplishment. In every medical journal we see reports of new techniques. For years gone by the entrance into the eye of a nonmagnetic foreign body was synonymous with the complete loss of vision and frequently loss of the entire eyeball. Now we have presented the direct vision method of removing these by means of an instrument similar to the urologist's cystoscope. The magnetic foreign body has called forth

much study and now is one of the more simple surgical procedures when accompanied with the improved X-ray localization and the smaller, less powerful hand magnet. It is my opinion that the use of the so-called giant magnet will surely bring out the foreign body, but, that due to its great power it will also in many cases so damage the eye that it makes the operation a failure so far as vision is concerned.

Psychosomatic Approach in Industry

Medicine is at the present time well along in the development of a new concept[5] which I believe we may in the future consider a basic part of the industrial relations department of industry. This concept is in the field of neurophysiology and had to do with the emotional factor of the employees. We know that pain is a sensation which originates from two sources: first, from the sensory nerve, such sensations as we would experience from a burned eye or a sprained ankle; and second, an influence on the interpretation of that pain sensation by the activity of the memory and reasoning division of the brain. The neurophysiologists have proved that both the pain sensation from the body and the emotional discharge from the brain are poured into the same general receiving station or, as they call it, the "internunciary pool." To explain this complex mechanism—here we have an employee who currently is experiencing a high degree of emotional instability due to family and financial worries. These problems are causing what we may term a distinct emotional trauma. Now we add an injury to the eye which is as a usual thing, minor, but moderately painful. He also now develops a fear of the consequences of this injury, adding another emotional trauma. As a result he does not react in the usual pattern but has intense pain and complains bitterly of his condition. In the past we have said that this man has a low pain threshold, or even that he is a sissy. Such is not the case. What we do have is two definite injuries, and an alleviation of either will result in benefit to both, or better yet, prevention of emotional trauma will aid in case of physical trauma and may even be a factor in the prevention of physical trauma. To operate this concept on a practical basis we should then make our industrial relations department (and well-trained personnel is, of course, a necessity) a father-adviser to the

employee group. This should be a department where even marital difficulties can be confidentially discussed and sound advice given. On the other hand, the medical staff must be educated to this concept and great care taken not to add emotional trauma to physical trauma by ill-chosen conversation or statements pertaining to the injury. This plan is being used to a considerable extent at the South Charleston plant of Carbide and Carbon Chemicals Corporation, not as an outgrowth of this concept, but as a policy of good will on the part of the company. Certainly, we will be able to improve it materially in the future.

Hopes for the Future

It would hardly be fair to end this paper without telling you what we hope for in the future. We all know the contact lens as an appliance is limited, more or less, to the cosmetic field and to a few selected cases of damaged and diseased eyes, but can you imagine a contact lens that can be worn safely and comfortably over long periods of time—that has built into it a nonbreakable, impenetrable factor similar to the present-day safety glass? Along with this can you imagine a safety glass that is light and comfortable to wear?

Medical men as a class are dreamers, dreamers of the impossible, it would seem, but in this age of accomplishment is anything impossible? Treatment of chemical burns, beta-radiation, antibiotics, corneal transplantation, safety eye wear, visual education programs and many more—how many of you here have known of those contributions to industry for more than a few years? How small these things will seem in the years to come, with industry and medicine cooperating under the guidance of voluntary and official agencies concerned with problems of health and sight conservation.

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Reading Difficulties and Eye Defects*

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AUTHOR points out that in the consideration of reading difficulties and eye defects, not only are there ideological factors to be considered but also general physical disabilities, endocrine deficiencies, hearing problems, and general debilitating diseases, as well as psychological factors.

A reading block which has existed from the beginning of the child's education may not become apparent for a long period of time, and in this way interfere with his entire educational program. For this reason, patients who fail to progress educationally may be found in almost any age group. It would appear obvious that more can be done to eliminate causative factors if the condition is observed and corrected at an early stage in life when the individual is more pliable. When educational institutions report as high as 20 per cent of the student body as having reading difficulties, everyone is anxious to aid the afflicted victims.

In the enthusiasm of my first few years associated in the study of reading disabilities, I had the feeling that a great portion of it was attributable to ocular defects. Many factors have changed my opinion to quite a degree. First of all, many youngsters with definite deficiencies in visual acuity and many one-eyed children have been found to be so-called fast and accurate readers. Secondly, I have found that there are many factors that come into play in analysis of the entire problem. It has been suggested by English writers that a portion of the problem, particularly the tendency for reversals, inversions and mirror reading, are the result of a congenital

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defect associated with the myelinization of various tracks in the brain tissue itself. The importance of mixed dominance in relation to reading problems has been stressed. There have been many other closely allied theories to explain the presence of this defect. The factor of inheritance certainly should be taken into consideration in an analysis of causative agents.

When we had become thoroughly satisfied that ocular factors were only a small part of the entire picture, we decided to carry studies further to find out, if possible, all the factors involved. In analyzing the entire problem, we felt it wise to divide our material into three parts: etiological factors, diagnostic procedures, and treatment. The etiological factors we have mentioned previously in part, but there are other important factors to be considered: general physical disabilities, endocrine deficiencies, hearing problems, and general debilitating diseases. Among psychological factors we must consider neurosis, psychosis, mental retardation, familial emotional problems, and other emotional disturbances. In addition, we must consider the educational factors involving poor training in reading due either to poor school attendance or to frequent changing of schools. Often these circumstances are concomitants of family maladjustments. Also they may be unsatisfactory reading habits, either innate in the individual or developmental in nature.

Visual Acuity

The ocular part of the picture is not tremendous in itself but is usually found as one of many factors. Ordinarily the correction of only a small part of the disturbance pattern will not improve reading ability. Thus we must always be ready to work with all groups, eliminating as many of the factors as is possible. Reduced visual acuity on the basis of definite ocular pathology can sometimes be corrected surgically, but this is not always possible. For instance, congenital cataracts may be corrected, corneal transplants may be done for severe corneal scarring, but frequently there are conditions which have gone beyond surgical correction. It is possible to help many of these patients with special types of lenses including contact lenses, telescopic lenses, and other ocular aids which help them make the most of their reduced visual acuity.

Refractive errors in themselves may be of minor degree and unimportant in a problem of reading. Frequently it is almost impossible to tell whether the correction of the refractive error will aid at all. Unfortunately it is necessary at times to prescribe lenses without the certain knowledge that they will definitely help the patient. It would seem most important to correct any marked degree of astigmatism. Correction for small degrees of farsightedness do not appear to be especially beneficial nor do minor corrections for nearsightedness, but the effectiveness of lenses can only be thoroughly understood when considered in the light of the muscular balance noted in the patients. In my opinion muscular imbalances themselves, more definitely than any other ocular defect, are a factor in poor reading. It may seem odd that patients with severe defects of muscular imbalances are actually better off than those with minor defects. Experiments at the Harvard Laboratories have indicated that monocular reading more often than not surpasses binocular reading. Obviously the answer to this discrepancy lies in the fact that when both eyes are working synchronously the reader must use effort to maintain the balance between the two eyes continuously whereas a monocular reader does not have this factor to consider.

Fusion

Wherever it is possible we attempt to restore normal fusional status to any patient suffering from reading problems. It has always been known that the sensitivity of individuals varies tremendously and that where a small defect may be of no hindrance to one person another individual may be completely blocked in his work by the same kind of defect. We have found continuously that small degrees of fusional disorder respond readily to various forms of orthoptic training and, amazingly enough, the effect shows itself frequently in the increased ability to read after such training. Patients suffering from fatigue of accommodation often show reading blocks. Obviously there are some patients who have ocular defects which do not respond to treatment and others who show physical improvement from treatment but no improvement in reading.

We have carefully analyzed the question of aniseikonia in reading disability and have found this defect to be present in a number of

patients. Improvement with use of aniseikonic lenses has been noted in a few patients but the number is not large. It is difficult to ascertain at times whether the ocular defect is present as a possible cause of reading difficulty or perhaps is present because of insufficient use of the eyes. For this reason, we have attempted to alleviate all difficulties, small and large, in the hope that at least a percentage of the patients will be aided in their over-all problem.

At the time that we attempt to rectify ocular deficiencies, all other physical problems are attacked with the same idea in mind, and all possible help is given in the removal of emotional blocks. When the physical handicaps have been alleviated or removed the various teaching specialists undertake to solve the mechanical problems involved in reading itself. Various types of instruments are used to stimulate rapid concentration and evaluation. Improper backgrounds in technique of reading are changed and, wherever possible, the simplest means of learning the art of reading replaces the unsatisfactory methods used.

It can be seen that this problem is not one that can be handled by either the physician or the educator alone, but requires teamwork in order to eliminate the various factors felt to be connected with the basic problem. When patients do not respond to treatment or teaching of any type it has made some people feel that this is a problem resulting from the innate lack of ability of the individual and, if a defect exists, nothing can be done to change it. I have always strongly worked against a defeatist attitude and shall continue to do so. Certainly no progress in any problem will ever be solved with this approach.

At the present time we certainly do not correct all reading problems but we are able to aid at least a portion of those afflicted so that they can carry their education further. The very fact that a large percentage of reading disorders occur in people with high IQ's would indicate that there must be some underlying factor that can be corrected. It is only with the cooperation of all concerned that better understanding of the problem and better methods of treating it may be attained.

Note and Comment

New Manual on Toxic Eye Hazards.—The National Society for the Prevention of Blindness announces publication of a new manual on *Toxic Eye Hazards*, dealing with various safeguards against the many chemicals now used in industrial processes. The manual is the result of research undertaken by the Joint Committee on Industrial Ophthalmology of the American Medical Association and the American Academy of Ophthalmology and Otolaryngology on the effects of various chemicals on the eyes. Members of the Joint Committee on Industrial Ophthalmology are: A. D. Ruedemann, M.D., chairman; Hedwig S. Kuhn, M.D., secretary; John B. Hitz, M.D.; Glen H. Harrison, M.D.; Charles F. Kutscher, M.D.; E. B. Spaeth, M.D.; and R. G. Scobee, M.D.

Types of protective equipment best suited to specific hazards and a standard program for eye safety from chemical exposure are covered in sections of the book contributed by experts in the fields of industrial ophthalmology and safety engineering. These recommendations are based on actual studies over a period of two years of conditions in a chemical manufacturing center of the country. In the group of plants in this center, eye injuries comprised 25 per cent of all injuries to employees.

A unique and valuable feature of the 102-page manual are the tables of toxic chemicals and their effects on the eyes, classified under organic and inorganic compounds, detergents and soaps. Another section deals with specific first-aid procedures for chemical eye injuries. Many charts and illustrations, and a comprehensive list of references for additional reading, are included.

Designed both for laymen and professional personnel, the manual will be useful to anyone concerned with industrial eye injuries and problems of protection—safety engineers, insurance research specialists, claim adjusters, medical directors, ophthalmologists, and nurses. Copies of *Toxic Eye Hazards* may be ordered from the National Society. The price is $1.00 per copy, with reductions for quantity orders.

New Institute for the Postgraduate Study of Ophthalmology.—Report was received of the recent amalgamation of the three London ophthalmic schools—Moorfield, Westminster and the Central Eye Hospital—into the Institute of Ophthalmology. The Institute was opened as one of the federated institutes of the British Postgraduate Federation of London University, and affords an increased scope for teaching and research. A rearrangement of the hospitals' facilities has made available for the use of the Institute the buildings formerly used by the Central Eye Hospital. The amalgamated hospital is said to be the largest eye hospital in the world. Sir John Herbert Parsons, Prof. Alan Woods, director of the Wilmer Institute, Baltimore, and Prof. H. J. M. Weve, head of the eye institute, Utrecht, gave the opening ceremony addresses. The two latter conveyed the good wishes of American and European ophthalmologists. The Institute will receive postgraduate students from all over the world, to carry on the noble tradition of its famous predecessors.

Highlights on Eye Health in the Preparation of Elementary Teachers.—What educational background do elementary teachers need in order adequately to discharge their functions in the school health program? To obtain detailed answers to this important question, Dr. Ernest I. Stewart, Jr., of Columbia University, submitted checklists to a jury of 39 experts either now employed in teacher-training institutions that offer health courses to elementary teachers or serving in capacities which keep them in direct contact with preparation of prospective elementary teachers, for their rôle in the school health program. The results of his study are expertly summarized in *A Study of State Certification Requirements Relating to the Preparation of Elementary School Teachers for Their Part in the School Health Program.*

The rôle of the elementary teacher in the school health program was defined in terms of nine basic functions formulated by the American Association of School Administrators in their 20th Yearbook, *Health in Schools.* Under each function were listed the topics which, if included in the teacher-training program, could contribute toward development of the competencies needed by the teacher to fulfill the function. The experts rated each topic on a five-point

scale which ranged from −2 to +2. (The former extreme indicated definite disapproval of including the topic in the college training program; the latter, indicated definite approval of including this topic.) Consequently, the highest score which a topic could receive was +2.

Several of the functions included specific items of interest to those concerned with conservation of vision, and it is most encouraging to note the ratings which these items received:

"Techniques for performing screening tests (vision, hearing, etc.)"	+1.97
"Conducting, assisting in, and interpreting tests designed to reveal or evaluate physical handicaps (Snellen, audiometer, etc.)"	+1.91
"Elementary principles and acceptable standards of heating, lighting, etc."	+1.97
"Care of the eyes and ears"	+2.00

From these results it is evident that health experts agree on the importance of preparing teachers to meet their responsibilities in the area of eye health of school children. Such studies as this should prove most valuable to college administrators and curriculum specialists who are faced with the problem of providing more functional programs for teachers colleges.

Eye-Banks Need Corneas.—There is still a serious need for corneas in order that sight may be restored to patients who are blind because of a corneal defect. Writing to the editors of various newspapers, Mrs. Aida de Acosta Breckinridge, executive director, The Eye-Bank for Sight Restoration, Inc., New York, N. Y., says:

"Each one of us, by the simplest procedure imaginable, may donate our eyes after death to restore sight to those blind because of some corneal defect. This may be done by the transplantation of the priceless dime-sized little piece of corneal tissue, thus magically freeing from darkness and dependence some person who is blind because of a scarred or clouded cornea, and whose life has been enshrouded in perpetual night.

"The donor's age, sex, race and blood type do not matter. The form for persons wishing to donate their eyes after death, as well

as our little booklet, 'A Gift Like the Gifts of God,' which explains the Eye-Bank, may be had by writing to The Eye-Bank for Sight Restoration, Inc., 210 East 64th Street, New York, 21, N. Y. The pledge is a voluntary one—no part of a will—and constitutes no binding obligation."

Attention is called, at this time, to the fact that healthy corneas from eyes enucleated by ophthalmologists in their practice will not go to waste if they are promptly forwarded either to The Eye-Bank for Sight Restoration, Inc., to any of its affiliated hospitals throughout the United States, or to independent eye-banks connected with established hospitals in various localities throughout the United States.

Medical Congress in Cape Town, South Africa.—Announcement has been received of a general medical congress to be held in Cape Town, South Africa, September 19–24, 1949, in which one section will be devoted to a consideration of eye problems. Writing to the National Society for the Prevention of Blindness, Kenneth Cunningham, M.D., extends a cordial invitation to any North or South American ophthalmologist to attend the congress, saying, "If any U.S.A. or South American ophthalmologist would like a holiday, he can be my guest for this week." Dr. Cunningham's address is: African Life Buildings, 85, St. George's Street, Cape Town, South Africa.

Conference on Industrial Safety.—The National Society for the Prevention of Blindness was represented by the chairman of its Industrial Advisory Committee, Leonard Greenburg, M.D., and by its consulting engineer, Charles P. Tolman, at the President's Conference on Industrial Safety, held in Washington, D. C., March 23–25. This was the third of a series of meetings planned, and covered comprehensively the whole subject of industrial safety, looking forward toward stimulating executive interest and thereby raising the standard of safety practice in industrial plants. Approximately 10,000 conferees took part in the meeting, and proceedings of the Conference will be published as a public document.

Usefulness of Contact Lenses is Limited.—Contact lenses will not take the place of spectacles in most cases in which ordinary

eyeglasses give serviceable vision, according to Conrad Berens, M.D., New York, member of the American Committee on Optics and Visual Physiology. This committee is composed of ophthalmologists from the Section on Ophthalmology of the American Medical Association, the American Ophthalmological Society, the American Academy of Ophthalmology and Otolaryngology, and the Association for Research in Ophthalmology. Writing in the June 18 *Journal* of the American Medical Association, Dr. Berens says:

"During the last few years considerable progress in the manufacturing and fitting of contact lenses has taken place in the United States. Not only are contact lenses now used for conditions which spectacle lenses will not correct, but many persons wear these lenses for cosmetic reasons, as well as for safety in certain sports and occupations.

"Despite the recent avalanche of commercial advertising, contact lenses will not take the place of spectacles in most cases in which ordinary eyeglasses give serviceable vision. In these cases contact lenses may be a useful adjunct to spectacles, but they do not enable most persons to discard their glasses completely.

"The largest group of aspiring contact lens wearers are those who have a psychologic aversion to wearing spectacles. For such persons contact lenses may be a great boon. However, the public should not be oversold on the use of contact lenses. Some manufacturers of contact lenses have misused the public vanity through advertising unwarranted claims for their products and their services."

Dr. Berens bases his conclusions on an investigation of contact lenses conducted by the American Committee on Optics and Visual Physiology in which certified specialists of the American Board of Ophthalmology were queried on their experience concerning results in the fitting of contact lenses.

Among complaints concerning the lenses, most frequently mentioned by the 575 physicians who replied, were the limited time that most patients can tolerate wearing the lenses, clouding of the solution used in wearing the lenses, and that the lenses are too expensive and many patients discard them. Cases of eye injuries, eye ulcers, and loss of an eye from clumsy technique in fitting the lenses have been reported.

Tentative Checklist on School Lighting.—Because of the many requests for a list to be used in checking lighting in school buildings, the National Society has prepared a tentative checklist on natural and artificial illumination in school buildings. Before considering the printing of a final form of this checklist, suggestions are being solicited regarding the material included, the method of presentation, and its practical use by teachers, college students preparing to teach, and other interested groups. Readers of the REVIEW who wish to offer their suggestions may request a copy of this tentative checklist.

National Health Council Annual Meeting.—"America's Potential for Health" was the topic of an address delivered by Mr. Basil O'Connor before the 29th Annual Meeting of the National Health Council, March 25, at the Hotel Roosevelt. Mr. O'Connor is president of the American National Red Cross and of the National Foundation for Infantile Paralysis. He spoke at the luncheon session which was attended by professional and lay leaders in the public health field throughout the country. In his talk he stressed the need for developing positive health for everyone through the use of local resources, and advocated extending full-time public health services to every county in the United States—a program endorsed by the American Medical Association and the National Society for the Prevention of Blindness.

The National Health Council, of which the National Society for the Prevention of Blindness is a member, is made up of 24 leading national health organizations in the United States.

New Publications.—Among new publications released by the National Society for the Prevention of Blindness within the past few months are the following:

No. 490. What You Should Know About Cataracts. 5 cts.

No. 491. Job Analysis as Related to Visual Skills, N. Frank Stump, Ph.D. 10 cts.

No. 492. Opportunities for Eye Health Education in the Secondary Schools, Marjorie A. C. Young, M.Ed. 5 cts.

No. 493. The Wise Owl Clubs of America. 5 cts.

No. 494. Toxic Eye Hazards. $1.00.

No. 495. The Public Health Worker in Conservation of Vision for Old Age, A. L. Chapman, M.D. 5 cts.

No. D190. Glaucoma: A Problem for the Public Health Nurse, Helen E. Weaver, R.N. 5 cts.

No. D191. Language of Light. $1.00 per C; $7.50 per M.

The Society has also released three new posters within the past year—orders taken for $1.00 or over. They are:

Poster E-7. See Better—Play Better. 15 cts.

Poster E-8. The Missing Piece Can Never Be Replaced. 15 cts.

Poster I-2. The Wise Owl Takes No Chances—Wear Your Goggles. 15 cts.

Discounts are given on quantity orders of both the posters and the publications.

Preston S. Millar, 1880–1949.—It is with profound sorrow that we announce the death of Preston S. Millar. A staunch supporter of the National Society, in deed as well as in word, Mr. Millar began his long voluntary service in prevention of blindness in 1915, when he became a member of the first board of directors of the National Society. Early in 1922 he was elected to the Society's executive committee and in 1935 he was also made vice-president. Year after year he fulfilled his responsibilities in these capacities, but beyond that he was always a mentor and friend of the cause. He could be called upon at any time; no matter how pressing his professional duties might be, he would never turn down a request for guidance or help. Year after year he arrived promptly for committee meetings, always with a beaming smile and a gracious will to serve. He had the rare quality of humility in his devotion to his fellowmen.

Readers of the REVIEW have had opportunities—all too few, to be sure—to learn of Mr. Millar's fine work in developing and checking lighting techniques. Once or twice we have been fortunate enough to publish an article written in his own inimitable and talented style. Recently, he brought his gift of words to his chairmanship of the Society's luncheon meeting, at which were summed

up the achievements of the Fortieth Anniversary Conference. Perhaps no better measure of the man can be taken than to quote from his own philosophy on happiness, as expressed in one of his essays:

"Happiness that grows out of enduring satisfaction is the major element of success in life. Such happiness may be attained through constructive achievement; through service to others; through contribution to the upbuilding of the race; through improvement of one's own character; through search for truth; and through intelligent discrimination of right and wrong. These approaches to happiness are interrelated. One can hardly engage in any one of them without advancing in the others.

"A life fashioned in this manner will be happy in itself and will radiate happiness upon others. It will exemplify successful living."

Mr. Millar lived his philosophy, in which "service to others" was a driving force. To the National Society for the Prevention of Blindness and to the whole sight conservation movement, his loss is irreparable. But we can still draw on the indomitable spirit which remains—an eternal monument of the man.

Current Articles of Interest

Diseases of the Eye in Relation to Dental Surgery, J. H. Doggart, M.D., *The British Journal of Ophthalmology,* June, 1949, published monthly by the British Journal of Ophthalmology, Ltd., 24, Thayer Street, London, W.1., England.

Diseases of the eye in relation to dental surgery are described by the author under two headings: Associated Ocular and Dental Lesions; and The Teeth as a Source of Ocular Infection. Under the first heading are included developmental defects, trauma, diseases of other organs and tissues, such as bone and endocrine diseases, and toxic hazards, such as lead, phosphorus, and nicotine. The second heading includes the following diseases which ophthalmologists regard as sometimes due to dental disease: orbital cellulitis (inflammation of cellular tissue); dacryocystitis (inflammation of the lacrimal sac); blepharitis (inflammation of the eyelids); conjunctivitis, episcleritis (inflammation of the subconjunctival tissues or of the sclera); keratitis (inflammation of the cornea); iridocyclitis (inflammation of the iris and the ciliary body); choroidoretinitis (choroiditis associated with retinitis); venous thrombosis; cataract; and lesions of the optic nerve. Dr. Doggart's opinion regarding the relation of dental with ocular disease is indicated as follows:

"1. Harmful substances can certainly pass from the teeth to the eyes, and possibly in the reverse direction.

"2. I do not believe that the teeth are mainly to blame in more than a small minority of the cases of ocular disease.

"3. The causation of disease is infinitely more complex than most people realized three or four decades ago, when the doctrine of focal sepsis was approaching the peak of its popularity."

The author concludes his paper with a word concerning cooperation between dental and ophthalmic surgeons. A reasonable precaution, except in urgent cases, is to postpone intraocular surgery pending dental treatment, where gross oral sepsis exists.

Management of Industrial Ocular Injuries, Harold M. Griffith, M.D., *The Pennsylvania Medical Journal,* March, 1949, published

monthly by The Medical Society of the State of Pennsylvania, 230 State Street, Harrisburg, Pennsylvania.

The author points out that a substantial proportion of eye injuries in an industrial community occurs in industry itself and is covered by state compensation insurance laws. Efficient care of these injuries is important not only to the injured person but also to the employer and insurance carrier. The uninterrupted operation of a plant may often depend upon the quick return of an injured man to his job. In a study of one large industrial plant it was revealed that over the past three years there had been a yearly average of 7,000 eye injuries of all types. Of these, 92 per cent were foreign bodies, corneal or conjunctival. It is possible to instruct nurses to handle many injuries of this type, referring to the ophthalmologist those involving any laceration or abrasion, any impairment of vision, or any suspicious symptoms. The ophthalmologist who takes care of the eye injuries in an industrial plant must have an intimate knowledge of the plant jobs, in order to say, for example, whether or not a man whose eye injury requires wearing a patch is capable of doing his job. In many skilled or hazardous jobs, binocular vision is necessary, which precludes wearing a patch. Dr. Griffith urges prompt referral of all cases such as any penetrating wounds where time is of essence in saving eyes. In smaller communities where there is no eye hospital, he believes that an exclusive eye operating room should be set up, since no single factor can do more to promote proper management of ocular injuries.

Sarcoidosis: The Systemic and Ocular Manifestations, Alan C. Woods, M.D., *Transactions* American Academy of Ophthalmology and Otolaryngology, March–April, 1949, published bimonthly by the Douglas Printing Company, 109 North 18th Street, Omaha 2, Nebraska.

Sarcoidosis is a relatively benign chronic disease of unknown etiology and characterized by the presence in any organ or tissue of epithelioid cell tubercles. Among the reasons for its importance to ophthalmologists are: almost 50 per cent of sarcoid patients show ocular involvement; between 5 and 10 per cent of uveitis is due to sarcoid; and, while elsewhere in the body, symptoms may be inconsequential, in the eye they include marked impairment of

functions and often cataract, glaucoma, and phthisis bulbi (shrinking of the eyeball). The disease affects almost any part of the eye except the cornea and sclera. In his summary remarks, Dr. Woods states:

"This disease is vastly more common than formerly supposed. During the last six years, since attention has been focused on sarcoidosis, there has rarely been a time when one or more cases of ocular sarcoidosis have not been in the wards of the Wilmer Institute. Sarcoidosis is, in short, a disease entity which the ophthalmologist should always consider in the study of any nodular disturbance of the eye or adnexa and should always regard as a possible etiologic factor in granulomatous uveitis."

Glaucoma and Orally Administered Belladonna, Egon V. Ullman, M.D. and Frank D. Mossman, M.D., *Northwest Medicine*, April, 1949, published monthly by the Northwest Medical Publishing Association, 309–10 Douglas Building, Seattle 1, Washington.

The observations of the authors are based on a series of six cases in which extract of belladonna or tincture of belladonna was given for gastrointestinal complaints. Their report shows that acute congestive glaucoma may be precipitated and that preglaucomatous eyes may be made worse by the indiscriminate oral use of belladonna or its derivatives. In approximately twenty-five cases of primary glaucoma, six, or about 25 per cent, were either induced or aggravated by the internal use of belladonna. Investigating the pharmacies in Portland, Oregon, the authors found that out of each one hundred prescriptions, an average of 10 per cent contained belladonna, which indicates how frequently this drug is used. Also in many states a prescription for belladonna can be refilled without a new prescription. The authors provide the following summary:

"It has been shown that prolonged oral use of extract of belladonna can produce acute congestive glaucoma as well as preglaucomatous states of the eye.

"If these observations are confirmed by others, steps should be taken by the Society for the Prevention of Blindness to make prescriptions for extract of belladonna and tincture of belladonna subject to regulations so that they cannot be refilled without a prescription of a physician."

The Facilitation of Visual Tasks, with Special Reference to Near Work—The Ettles Lecture, 1948, H. C. Weston, M.D., *The Optical Practitioner*, December, 1948, published by The Association of Optical Practitioners, 65, Brook Street, London, W. 1, England.

In his discussion of the facilitation of vision, the author considers the "work" as sights, which need to be assessed and graded in terms of the demand they make for various visual capacities. The characteristics of visual tasks which must be ascertained are: the distance of what is to be seen; the size of these objects; and the brightness and color of these objects and of the surroundings. The means of facilitation of vision include: lighting, the primary facilitator; youth; ophthalmological means (eyeglasses); the size of work objects; contrast; optical facilitators, such as the telescope; mechanical facilitators, such as the pantograph (an instrument used to copy maps, etc.); and organization in work-sights. After discussing the investigations which have been made concerning visual facilitators, Dr. Weston states:

"In conclusion, I would emphasize the need for a proper understanding of the nature of particular visual tasks if the most suitable methods of facilitation are to be applied. Illumination is essential for all visual tasks, but various other means of facilitation are available and desirable, so that those of us who may be chiefly concerned with one means will do well to appreciate the value of the others, and to recognize the limitations of each."

The Crosseyed Child—A Social as well as a Medical Problem, Watson Gailey, M.D., *New Orleans Medical and Surgical Journal*, February, 1949, published monthly by the Louisiana State Medical Society, 1430 Tulane Avenue, New Orleans 12, Louisiana.

In his discussion, Dr. Gailey takes up the following problems: the problem of the parent, who should be informed that the ocular muscles are inserted on the exterior of the globe, that their main function has to do with movements rather than with the sight of the eye, and that surgery is almost painless and is based on measurements, not guesswork; the problem of the child, whose primary concern is his appearance, which often causes him to become a behavior problem in the home and at school; and the problem of the adult with squint, who, despite his education and experience,

finds himself discriminated against by large industrial concerns because vision in the one eye is so low. Four fundamental considerations should be made clear to parents by the ophthalmologist, as follows: not one spontaneous cure of squint occurs in every hundred cases; the child should be taken to an eye doctor as soon as the slightest deviation from parallelism is detected; not all children require surgery to correct their squint; and, if surgery is necessary, it is not hazardous to life or to sight. Dr. Gailey provides the following summary:

"The psychic problems of children with squint are even more important than the ocular problems, which are readily managed by nonsurgical or surgical measures. Parents need education as to this condition. Ophthalmologists should make themselves responsible for the dissemination of correct information about this defect, the most important consideration being that the child should be taken to a competent ophthalmologist as soon as the slightest deviation from parallelism is detected."

Fundamentals of Color Vision, W. D. Wright, D.Sc., Ph.D., *The Optician*, March 25, 1949, published weekly by The Hatton Press Ltd., 72–78 Fleet Street, London, E.C.4, England.

In a paper presented at a course on "Color and Lighting in Factories and on Machines," organized by the Council of Industrial Design and the British Color Council in November of last year, Dr. Wright discussed the fundamentals of color vision, including the following topics: color of a surface; spectrum; color perception process; lightness of a colored surface; adaptation of the eye; color contrast; contrast and visibility; Purkinje phenomenon; defective color vision; color and the stereoscopic sense; psychology and esthetics of color; and color solids and systems. Color perception is based on the fact that the eye can distinguish one wavelength from another by its color, which implies that light-sensitive receptors in the retina respond differently according to the wavelength. The adaptation of the eye refers to its sensitivity, which is constantly changing in a direction tending to adjust the response to a constant level. Under a high illumination the sensitivity is decreased, while in the dark, the sensitivity is increased. A few minutes are required to become light adapted and half an hour or

more to become dark adapted. Regarding contrast and visibility, the author points out that maximum contrast and maximum visibility between two surfaces depend more on light than on color of the contrasting areas or that color contrast is less effective than lightness contrast. Thus black and white provide a greater contrast than any other two colors. In the discussion on defective color vision, the author warns that industry should not develop color so highly that color defectives are even more handicapped than at present.

Light for the Plant, *National Safety News*, March, 1949, published monthly by the National Safety Council, Inc., 20 North Wacker Drive, Chicago 6, Illinois.

Citing the change within the past ten years in the concept of illumination to include the whole illuminated environment, rather than the lighting problem alone, this paper takes up the following topics: light and accidents, natural light, artificial light, levels of illumination, modern light sources, and special lamps and fixtures. Although statistics are meager concerning the proportion of industrial accidents due to poor lighting, estimates vary from 15 to 25 per cent. Available sources of daylight should be used, but it will be found necessary to depend upon artificial lighting for 20 to 50 per cent of the total working hours, in the typical plant, excluding night work. Standards of illumination which may be found in American Recommended Practice of Industrial Lighting and the IES Lighting Handbook, range for general overhead lighting from 5 foot-candles for storage areas to 50 foot-candles where the seeing task is more exacting. For fine work supplementary lighting should be used to provide 100 foot-candles. For extra fine work 200 foot-candles are recommended. Modern light sources include the incandescent lamp, the fluorescent lamp and the high-intensity mercury vapor lamp. Special lamps and fixtures include the vibration-resistant lamps, weather-resistant lamps, explosion-resistant fixtures and infra-red lamps.

Special Report from the Committee for the Study of Congenital Malformations of the American Academy of Pediatrics—Study of the Relation of Congenital Malformations to Maternal Rubella

and Other Infections: Preliminary Report, Herbert C. Miller, M.D., (Chr.), Stewart H. Clifford, M.D., Clement A. Smith, M.D., Josef Warkany, M.D., James L. Wilson, M.D., and Herman Yannet, M.D., *The Journal of Pediatrics*, February, 1949, published monthly by The C. V. Mosby Company, 3207 Washington Boulevard, St. Louis 3, Missouri.

This study which was supported by a grant from the National Society for the Prevention of Blindness, is summarized by the authors as follows:

"1. The data on 199 cases of maternal rubella have been presented according to the method by which the maternal infection was diagnosed and according to the period of gestation in which it occurred. The difficulties in timing the maternal infection in retrospect from a history have been pointed out. The incidence and types of defects that occurred in the 199 children have been discussed.

"2. Evidence is presented to indicate that sharp peaks of prevalence of rubella occur simultaneously in many parts of the United States in the spring of the year.

"3. Replies were received on 14 children with the so-called rubella syndrome whose mothers were considered to have had no infection during pregnancy, indicating either that the mothers had rubella but did not know it or that the rubella syndrome has more than one etiology.

"4. The difficulties involved in planning an investigation which will give more accurate information concerning the incidence of congenital defects subsequent to maternal rubella have been discussed.

"5. Evidence obtained from a survey of Kansas physicians is in agreement with previously reported data and indicates that perhaps 5 per cent of congenital defects are associated with maternal rubella.

"6. A total of 26 cases of maternal measles, mumps, chicken pox, infectious mononucleosis and poliomyelitis are reported in the present study. Seventy-seven cases of the above infections that occurred in the first four months of pregnancy have been collected from the literature, including those from the present study. The number is too small to draw any definite conclusions concerning

any specific disease. The high incidence of defects following maternal infectious mononucleosis deserves especial attention."

Important Concepts Underlying Lighting for Critical Seeing, Matthew Luckiesh, *Illuminating Engineering*, April, 1949, published monthly by the Illuminating Engineering Society, 51 Madison Avenue, New York 10, New York.

Mr. Luckiesh simplifies the matter of lighting by isolating the basic concepts, facts, and principles, which have been soundly established through the evolution of knowledge in this inherently complex field. He describes light and vision as tools used for the performance of seeing or, in other words, the means by which a human being operates as a human seeing-machine. This concept of the science of seeing is an important evolution which has become clarified and extended during recent decades. It is the humanitarian concept of conserving human resources which is a primary factor in the design and acceptance of higher levels of illumination. When attention is focused primarily upon the visual task, the visibility of critical details is very important. But when considering the performance of that task over a prolonged period of time, ease of seeing is also important. At present visibility-level can be measured relatively easily, but as yet no single practicable method of measuring ease of seeing is available. The latter is made difficult to measure since it involves psychophysiological effects resulting from the performance of prolonged critical seeing. Researches in this important concept offer much to be done before the picture is complete.

Personal Protection—The Eyes and Face, *National Safety News*, March, 1949, published monthly by the National Safety Council, Inc., 20 North Wacker Drive, Chicago 6, Illinois.

Eye protection occupies a prominent place in every plant safety program, since eye injuries are among the most serious of industrial casualties. Pre-employment eye examinations and periodic re-examinations aid in determining the fitness of the employee for various jobs. They reveal visual defects for which the employee is referred to an eye doctor to be fitted with glasses. The worker can then have his prescription ground in heat-treated lenses for his

safety goggles. The types of goggles designed to fit the need of the particular job include: spectacle goggles, cup goggles, rubber mask type goggles, dust goggles, miners' goggles, and melters' goggles. Glass has been developed which will filter out harmful ultraviolet and infra-red rays present in operations where there are high temperatures and excessive glare. Sun glasses are not suitable as ray-filter glasses for industrial exposures, since they are designed for protection only against glare and many of the cheaper ones show considerable distortion. Other topics discussed in this report include face shields, which also protect the eyes, hoods and helmets, and the care and fitting of goggles.

The Significance of Ocular Complications Following Vaccination, Emanuel Rosen, M.D., *The British Journal of Ophthalmology*, June, 1949, published monthly by the British Journal of Ophthalmology, Ltd., 24, Thayer Street, London, W.1, England.

The author's stated purpose is to show that ocular complications developing within a specific period after vaccination are part of a post-vaccinal ocular syndrome and that such a relationship may exist in other organs. He suggests that patients be examined more carefully before vaccination is performed. Seven case studies are presented as well as summaries of a number of others. Dr. Rosen reviews the literature on the subject, including his own observations of patients who were vaccinated during the recent mass vaccination in New York City. The most frequently observed ocular complications in these cases were "flare-ups" of dormant conditions.

Responses to the Ishihara Test for Color Perception, J. B. Nolasco, M.D. and Deogracias Rodil, M.D., *Archives of Ophthalmology*, January, 1949, published monthly by American Medical Association, 535 North Dearborn Street, Chicago 10, Illinois.

The Ishihara test is one of those using the pseudoisochromatic plates to detect abnormalities of color perception and is the most convenient test for mass examination. The Ishihara color plates were used to test approximately 2,000 male and female students seeking admission to the University of the Philippines. Among the male subjects, 43.2 per cent made perfect scores, while an equally

large number made 2 mistakes, mostly on plates 10 and 11. Disregarding the results in these plates (which appear to give misleading values), the incidence of defective color vision amounts to 4.3 per cent. This is almost the same as the incidence of subjects who failed in plate 4, which was 4.1 per cent. Among the female subjects, only 0.3 per cent had defective color vision, using the Miles's criterion, or 0.2 per cent, using the criterion of Hardy, Rand and Rittler. Plate 4 gave an incidence of 0.2 per cent. The examination was conducted in an open hall with indirect sunlight. The authors express the view that the values reported are probably lower than those which would be obtained if "average daylight" illumination had been used.

Color Blindness, Lt. Comdr. Dean Farnsworth and Conrad Berens, M.D., *Hygeia*, September, 1948, published monthly by the American Medical Association, 535 North Dearborn Street, Chicago 10, Illinois.

The authors point out that extravagant claims for "curing" color blindness reached a climax during the recent war. The proposed remedies included among others: electrical stimulation of the eyeballs; injections of iodine; staring at flashing red and green lights; wearing colored goggles; and injections of extracts from cobra venom, marigolds, and lobsters. Unfortunately, these "discoveries" were often announced publicly before they could be tested by psychologists or ophthalmologists. The persons who devised these inventions were not specialists in color theory or in test methods. In no instance could the reported benefits be duplicated under controlled investigation. In a report adopted by the American Academy of Ophthalmology and Otolaryngology, the American Ophthalmological Society, and the Section on Ophthalmology of the American Medical Association, the following facts are disclosed, as summarized by Lt. Comdr. Farnsworth and Dr. Berens:

"The testimony is conclusive that no method has been found for the correction of color blindness, whether called 'color weakness,' 'color confusion' or 'color defectiveness.' Men can be coached to pass tests, but their physiologic deficiency cannot be repaired. Any claims to the contrary, any 'treatment' which convinces operators that they can see colors they could not see before will decrease

safety in transportation, decrease security in national defense and decrease efficiency in industry."

The Nonsurgical Treatment of Squint, Walter S. Stevenson, M.D., *New Orleans Medical and Surgical Journal*, February, 1949, published monthly by the Louisiana State Medical Society, 1430 Tulane Avenue, New Orleans 12, Louisiana.

Dr. Stevenson limits his discussion to the nonparalytic, manifest types of squint (strabismus), which he defines as any deviation of the eyes from parallelism, for either near or distance vision, apparent to an observer. Manifest squints are divided into two types: horizontal (one or both eyes turn inward or one or both eyes turn outward); and vertical (one or both eyes turn up or down). In summary, the author makes the following recommendations:

"1. The most important consideration in the treatment of squint, regardless of the type, is that the patient should be seen promptly.

"2. Repeated measurements should be made with prisms, the vision should be checked frequently and carefully, and refraction of the eyes should also be carried out frequently.

"3. Amblyopia may be treated by any method productive of good results, but whatever method is adopted should be used cautiously and the results should be interpreted intelligently. Both the type of child and the type of family should be taken into consideration before any method of treatment is employed.

"4. If exercises and orthoptic training do not produce parallelism of the visual axes, surgical intervention at the proper time is to be recommended. A trial of both measures is, however, necessary before operation is done.

"5. If after operation there is a tendency for the squint to recur, exercises are useful, particularly in the external type of squint.

"6. Patching or any desired type of visual training should also be continued following surgery if the indications exist."

Penicillin as a Prophylactic against Ophthalmia Neonatorum, A Comprehensive Study, Arthur Sacks-Wilner, M.D. and Erwin P. Sacks-Wilner, M.D., *Archives of Ophthalmology*, April, 1949, published monthly by American Medical Association, 535 North Dearborn Street, Chicago 10, Illinois.

In their study of penicillin as a prophylactic against ophthalmia neonatorum, a total of 251 newborn infants were included. Before instilling penicillin, 20.7 per cent had gram-positive cocci on smear, 0.4 per cent had gram-positive rods, none had gram-negative cocci, and 0.8 per cent had gram-negative rods. Twenty-four hours after the instillation of penicillin, 9.9 per cent had gram-positive cocci, 0.4 per cent had gram-positive rods, none had gram-negative cocci, and 0.4 per cent had gram-negative rods. On leaving the hospital, 12.8 per cent had gram-positive cocci, none had gram-positive rods, gram-negative cocci or gram-negative rods. In their discussion the authors take up three basic questions: What is the value of silver compounds in prophylaxis (efficacy and dangers)? What is the value of penicillin (efficacy and dangers)? Do newborn infants need any therapy besides irrigation of the conjunctival sacs with an isotonic saline solution? This last question is left for further investigation, although the authors believe that it is probable that, if the mother has had proper prenatal care, the newborn infant's eyes will need only ocular irrigation with a saline solution. In the authors' experience, the sodium salt of penicillin (5,000 units per cubic centimeter) is nonirritating, is not painful, does not decompose into harmful chemical agents, is less likely to cause chemosis, edema or redness, and incurs no danger of permanent injury to the cornea or the conjunctiva. The concluding comment of the authors follows:

"It is clear that in penicillin one has a prophylactic and therapeutic agent which makes blindness or impaired vision from ophthalmia neonatorum no longer excusable."

Pathogenesis of Concurrent Eye and Joint Diseases, Erik Godtfredsen, M.D., *The British Journal of Ophthalmology*, May, 1949, published monthly by the British Journal of Ophthalmology, Ltd., 24 Thayer Street, London, W.1., England.

Dr. Godtfredsen explains that since the etiology and pathogenesis of such diseases as iridocyclitis, scleritis, and phlyctenular conjunctivitis are still obscure, and since these diseases frequently occur in association with joint diseases, it is pertinent to analyze the nature and frequency of eye symptoms in joint diseases in an

endeavor to elucidate these pathogenic conditions. In summary, the author states:

"A clinical analysis is given of the incidence and symptomatology of concurrent eye and joint diseases. The medical joint diseases which are complicated by eye symptoms (phlyctenular conjunctivitis, scleritis, iritis, and keratoconjunctivitis sicca) all belong to the type of infective arthritis, partly acute and partly chronic (rheumatic fever, gonorrhoeal arthritis, Reiter's disease, Still's disease, and ankylopoietic spondylitis). The pathogenesis is presumably the same for the eye disease and the joint disease, being probably an allergo-toxic reaction to a primary bacterial or virus infection. This hypothesis is borne out by clinical points of resemblance to various generalized diseases affecting joints, skin and pluri-orificial mucous membranes (conjunctivitis, stomatitis, and affection of external genitals), where an allergo-toxic pathogenesis is certain or likely—Stevens-Johnson's syndrome, Behcet's syndrome, foot-and-mouth disease, serum disease, acute disseminated erythematous lupus, and intoxication by heavy metallic salts, notably sanocrysin and arsenicals."

Retrolental Fibroplasia, Incidence in Different Localities in Recent Years and a Correlation of the Incidence with Treatment Given the Infants, V. Everett Kinsey, Ph.D. and Leona Zacharias, Ph.D., *The Journal of the American Medical Association*, February 26, 1949, published weekly by the American Medical Association, 535 North Dearborn Street, Chicago 10, Illinois.

Retrolental fibroplasia is an eye disease which occurs in premature infants, usually affecting both eyes. It is characterized by a vascularized membrane located behind the crystalline lens. The presence of blood vessels in the membrane differentiates this disease from congenital cataract. The authors provide the following conclusions based on their studies:

"In certain areas the incidence of retrolental fibroplasia has increased significantly in recent years. In Boston, where the data are most complete, the rise in incidence was found chiefly in the 3- to 4-pound (1,361 to 1,814 gm.) weight group. The greater frequency of retrolental fibroplasia correlates with several changes in treatment of premature infants; i.e., use of vitamin supplements in

water-miscible form and increased use of iron. While a positive correlation between rise in incidence of the disease and change in treatment does not constitute proof of any causal relation between the two, nevertheless it is suggestive that the medication used may be of etiologic significance.

"To test this possibility, we, in conjunction with the staffs of the Boston Lying-in and certain other hospitals, are planning to investigate the effect on the incidence of retrolental fibroplasia of omitting the iron and also the multiple vitamin preparation in water-miscible form. It is planned to withhold the iron until the premature infant is between 2 and 3 months of age and substitute for the multiple vitamin preparation vitamin D alone, in a water-miscible form (1,000 units daily). In addition, the diet will be supplemented with 50 to 100 mg. of vitamin C daily. No vitamin A or B-complex will be given. The results of this study will be made available as soon as a sufficient number of infants has been tested to permit statistically valid conclusions concerning the true rôle of the aforementioned forms of treatment in producing retrolental fibroplasia.

"This study has been concerned wholly with premature infants whose birth weights were less than 4 pounds (1,814 gm.). The incidence of retrolental fibroplasia in heavier premature infants and in term babies has not been investigated, but, from the number of known cases of the disease in such infants, it must be extremely low. Before one draws inferences regarding possible harmful effects from the use of water-miscible vitamin preparations or iron in treating heavier premature infants or term babies, one should consider these facts."

The Illumination of the Snellen Chart, M. Gilbert and R. G. Hopkinson, *The British Journal of Ophthalmology*, May, 1949, published monthly by the British Journal of Ophthalmology, Ltd., 24 Thayer Street, London, W.1, England.

The authors present a study in which the standard Snellen chart was used to test the effect of illumination level on the visual acuity of 15 subjects in the age group 20–40. The investigation was carried out under the aegis of the Joint Committee on Lighting and Vision of the Building Research Board and the Medical Research Council, whose Mr. H. C. Weston collaborated closely. The results are

illustrated by tables which show that an increase in illumination of the order of 10:1 improves the acuity by one line on the Snellen chart. The effect is somewhat less for observers with good vision than for those with poor vision, especially for high levels of illumination. The authors feel that some standard of illumination of the Snellen chart should be set, especially when it is used as a pass test for persons entering a trade or profession. In circumstances where visual examinations must be conducted under unfavorable lighting conditions, the results of this study will aid the clinician in making allowances for such deficiencies in illumination.

Experiment in Prophylaxis of Ophthalmia Neonatorum with Penicillin, P. Halbron, F. Lepage, C. Lecomte and H. Mawas, *Annales d'Oculistique*, November, 1948, published monthly by Gaston Doin & Co., 8, Place de l'Odeon, Paris, France.

The authors have used two drops of a penicillin solution containing 5,000 Oxford units per c.c. in 2,000 newborn over a period of a year. During one month the solution was placed in one eye of the newborn and an ointment containing 1,000 Oxford units of penicillin per gram in the other eye. Only one child developed gonorrheal conjunctivitis; this infant was treated with penicillin and the eyes healed without any corneal lesion. One child developed a pneumococcal conjunctivitis and three, staphylococcal conjunctivitis; the total number of cases of conjunctivitis of all kinds was 24. Data are not given concerning the incidence of ophthalmia neonatorum at this hospital before the introduction of this method of prophylaxis. The authors state that 24 mothers were reported to have salpingitis, but believe that the actual number far exceeds this. Systematic vaginal smears were taken on 10 women during labor, in a continuous series; of these, two showed the gonococcus. However, neither of the two infants developed conjunctivitis.

Book Reviews

NEUROLOGY OF THE OCULAR MUSCLES. David G. Cogan, M.D. Springfield, Ill.: Charles C. Thomas, Publisher, 1948. 214 p., 69 illustrations.

The text is a carefully and well-written manual in which the author has assembled and enlarged upon a series of lectures which he had used in teaching postgraduate ophthalmology.

In the first three chapters the author discusses the physiology, anatomy, action and tonus of the extra-ocular muscles.

The fourth chapter is devoted to the arrangement, anatomy, physiology and clinical disturbances of the cranial nerves that innervate the extra-ocular muscles.

Chapters 5, 6 and 7 treat of the supranuclear connections of the ocular motor system and the cerebral and subcortical centers that regulate the conjugate and disjunctive movements of the eyes and the lesions that involve those centers.

Chapter 8 is devoted to the centers and tracts that control the pupils.

Chapter 9 considers the various types of nystagmus and the clinical significance of each variety.

A short summary of the contents is given at the end of each chapter.

The standard methods of examination for the detection of neurological anomalies of the eyes are reviewed. One of the main purposes of the book is to emphasize the importance of an analysis of the objective and topographic signs and symptoms in localizing the lesion in neurological derangements of the eyes.

The correlation of clinical disturbances with the physiology and anatomy of the centers and tracts that control the nervous mechanisms of the eyes is exceptionally well done. The manual includes about all that is known of the anatomy and physiology of those centers and tracts and the known signs and syndromes resulting from lesions in them.

The illustrations are numerous and well chosen and a comprehensive bibliography is appended.

Although the text is too technical for general use by lay workers who are interested in ophthalmology, this excellent book will be

found useful by the seasoned ophthalmologist as well as the novitiate in ophthalmology.

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FLUORESCENT LIGHTING. A. D. S. Atkinson. Brooklyn, N. Y.: Chemical Publishing Co., Inc., 1946. 144 p.

This understandable discussion introduces the new sources and the illuminating engineering for such sources in actual practice. The material is the latest information available as of the date of publication; however, in this field which is changing so rapidly it is necessary always to supplement a book with the manufacturers' listings and information.

The material deals in a broad manner with three subjects, (a) fundamental light theory, (b) fluorescent sources and equipment, and (c) application with emphasis on a quality lighting installation. The treatment is simple and understandable, requiring neither technical nor mathematical training in the subject matter.

In the portion devoted to the fundamentals, essential light and ultraviolet radiation are discussed without recourse to physical optics. Under the second division, operation, lamp characteristics, lamp circuits and installation design are discussed in a non-technical manner. Sufficient information is given on equipment design to indicate the problems in how fluorescent luminous design differs from that for incandescent lamp design. Sufficient information is given for the design of an installation where it is not feasible to call for the services of an illuminating engineering consultant.

That portion which deals with application of the fluorescent lighting for commercial, industrial and home lighting, considers methods by which *quality of lighting* may be obtained and leaves the question of quantity of light to the current recommendations for specific installations.

Though the author reviews British practice there is much which is applicable to the American methods. The book has a clear and simple style and gathers together in a concise form the knowledge of the subject available at the date of publication.

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